WHAT IS CLAIMED IS:

1. A method for generating a case-specific boundary locating routine for determining a boundary location on an image of an object that is imaged by a machine vision system having at least two image filtering elements, the method comprising:

identifying an area of interest on the image of the object that is imaged by the machine vision system, the area of interest indicative of the boundary to be located on the object;

determining at least two filtered image results in the vicinity of the area of interest, the at least two filtered image results based at least partially on at least one of the at least two image filtering elements;

selecting at least one of the at least two image filtering elements based on the at least two filtered image results;

determining the case-specific boundary locating routine, wherein the case-specific boundary locating routine comprises:

generating a pseudo-image that includes a boundary to be located on the object, the pseudo-image based on the at least one selected image filtering element; and

performing an edge detection operation on the pseudo-image to determine the boundary location, the boundary location useable as a dimensional inspection measurement for the object imaged by the machine vision system.

2. The method of claim 1, wherein performing the edge detection operation on the pseudo-image further comprises determining at least one edge point indicative of the boundary location and determining the boundary location based on the at least one determined edge point. 3. The method of claim 2, wherein the determining the at least one edge point further comprises determining at least one edge point based on a gradient analysis operation along a respective scan line that extends across the boundary location.

4. The method of claim 2, wherein the determining the at least one edge point further comprises:

determining a first edge point based on a first analysis operation along a respective scan line extending across the boundary location;

performing a second analysis operation on data associated with a plurality of pixel locations i that extend along the respective scan line in a local region that extends on both sides of the first edge point; and

determining a modified edge point to replace the first edge point based on the results of the second analysis operation.

5. The method of claim 4, wherein the second analysis operation comprises determining a value for each of the plurality of pixel locations i based on the data associated with the plurality of pixel locations and determining a centroid location along the respective scan line, based on a spatial distribution of the determined values.

6. The method of claim 5, wherein the value determined for each of the plurality of pixel locations i comprises a feature distance between the data associated with an (i+1) pixel location and the data associated with an (i-1) pixel location in at least one feature image corresponding to the at least one selected image filtering element.

7. The method of claim 2, wherein the determining the boundary location further comprises:

analyzing a set of determined edge points according to criteria comprising at least one of a local region conformity criterion, a local region feature-distance criterion, and a boundary shape criterion;

eliminating determined edge points which fail to meet the criteria, to determine a remaining set of determined edge points; and

determining the boundary location based on the remaining set of determined edge points.

8. The method of claim 7, wherein determining the remaining set of determined edge points further comprises eliminating determined edge points which are determined to be outliers relative to a straight or curved line fit to the determined set of edge points.

9. The method of claim 7, wherein determining the remaining set of determined edge points comprises eliminating determined edge points which are flanked by first and second local regions on opposite sides of the boundary which do not conform to representative characteristics established for the first and second sides of the boundary.

10. The method of claim 7, wherein determining the remaining set of determined edge points comprises;

determining a feature distance between first and second local regions flanking a determined edge point on opposite sides of the boundary, the feature distance based on at least one feature image corresponding to the at least one selected image filtering element; and

eliminating the determined edge point if the feature distance is less than a representative feature distance previously established based on similar first and second local regions.

11. The method of claim 1, wherein the determining the at least two filtered image results further comprises:

determining a first partial filtered image result for a first region in the vicinity of the area of interest on a first side of the boundary;

determining a second partial filtered image result for a second region in the vicinity of the area of interest on a second side of the boundary; and

determining a filtered image result based on a difference between the determined first partial filtered image result and the determined second partial filtered image result.

12. The method of claim 11, the determining the first and second partial filtered image results further comprising:

generating a filtered image in the vicinity of the area of interest based at least partially on at least one respective image filtering element; and

determining the first partial filtered image result and the second partial filtered image result based on that generated filtered image.

13. The method of claim 11, wherein the selecting the at least one of the two image filtering elements further comprises;

determining a filtered image result which exhibits a greatest difference between its respective first partial filtered image result and its second partial filtered image result; and

selecting the at least one of the two image filtering elements based on the determined filtered image result.

14. The method of claim 11, wherein the first and second regions are selected from a plurality of first and second region candidates.

15. The method of claim 14, wherein the first and second regions are selected based on first and second regions which produce a maximum difference between their respective first and second partial filtered image results, in comparison to a difference between respective first and second partial filtered image results produced by a remainder of the plurality of first and second region candidates.

16. The method of claim 1, further comprising determining a similar-case boundary location using the case-specific boundary locating routine.

17. The method of claim 1, wherein the machine vision system further comprises a part-program recording portion, and the method further comprises recording the case-specific boundary locating routine within a part program.

18. The method of claim 1, further comprising repeating the method for at least a second area of interest to determine at least a second case-specific boundary locating routine for determining at least a second case-specific boundary location on the image of the object imaged by the machine vision system.

19. The method of claim 1, the machine vision system further comprising predetermined groups of the at least two image filtering elements, each predetermined group corresponding to texture characteristics surrounding a boundary location indicated by the area of interest, wherein the determining the at least two filtered image results in the vicinity of the area of interest further comprises:

determining the texture characteristics in regions on both sides of the boundary location ;

selecting a predetermined groups of the at least two image filtering elements based on the determined texture characteristics; and

determining the at least two filtered image results such that each of the at least two filtered image results is based only on filtering elements that are included in that selected predetermined groups of the at least two image filtering elements.

20. The method of claim 1, wherein the pseudo-image comprises a membership image.

21. The method of claim 1, wherein the determining the case-specific boundary locating routine comprises:

generating a current pseudo-image based on the selected at least one of the at least two image filtering elements; and

determining at least one case-specific edge detection parameter value based on the generated current pseudo-image,

wherein:

the case-specific boundary locating routine further comprises the at least one case-specific edge detection parameter value, and the edge detection operation compares a

characteristic of the pseudo-image generated by the case-specific boundary locating routine to the at least one case-specific edge detection parameter value to produce a reliable edge point.

22. The method of claim 1, wherein the machine vision system further comprises an image display, a user input device, a graphical user interface and at least one edge tool, and the identifying the area of interest further comprises a user of the machine vision system indicating the area of interest by positioning the at least one edge tool relative to a boundary location on an image of an object displayed on the image display.

23. The method of claim 1, wherein at least the determining the at least two filtered image results, the selecting the at least one of the at least two image filtering elements, and the determining the case-specific boundary locating routine are performed automatically by the machine vision system.

24. The method of claim 1, wherein the at least two image filtering elements comprise texture filtering elements.

25. The method of claim 24, wherein the machine vision system comprises a color camera and the at least two image filtering elements further comprise color filtering elements.

26. A method for operating a machine vision system to determine a boundary location on an object that is imaged by the machine vision system having at least two image texture filtering elements, the method comprising:

identifying an area of interest on the object that is imaged by the machine vision system, the area of interest indicative of the boundary on the object;

generating a pseudo-image that includes the boundary to be located on the object based on at least one image texture filtering element pre-selected based on an analysis of a previous similar-case boundary; and

performing an edge detection operation on the pseudo-image to determine the boundary location, the boundary location useable as a dimensional inspection measurement for the object imaged by the machine vision system.

27. The method of claim 26, wherein performing the edge detection operation on the pseudo-image further comprises determining at least one edge point indicative of the boundary location and determining the boundary location based on the at least one determined edge points.

28. The method of claim 27, wherein the determining the at least one edge point further comprises:

determining a first edge point based on a first analysis operation along a respective scan line extending across the boundary location;

performing a second analysis operation on data associated with a plurality of pixel locations that extend along the respective scan line in a local region that extends on both sides of the first edge point; and

determining a modified edge point to replace the first edge point based on the results of the second analysis operation.

29. The method of claim 28, wherein the second analysis operation comprises determining a value for each of the plurality of pixel locations i based on the data associated with the plurality of pixel locations and determining a centroid location along the respective scan line, based on a spatial distribution of the determined values

30. The method of claim 29, wherein the value determined for each of the plurality of pixel locations i comprises a feature distance between the data associated with an (i+1) pixel location and the data associated with an (i-1) pixel location in at least one feature image corresponding to the at least one selected image filtering element.

31. The method of claim 27, wherein the determining the boundary location further comprises:

analyzing a set of determined edge points according to criteria comprising at least one of a local region conformity criterion, a local region feature-distance criterion, and a boundary shape criterion;

eliminating determined edge points which fail to meet the criteria, to determine a remaining set of edge points; and

determining the boundary location based on the remaining set of edge points.

32. The method of claim 26, wherein the boundary location is determined with a resolution of better than 100 microns on the object imaged by the machine vision system.

33. The method of claim 26, wherein the boundary location is determined with a resolution of better than 25 microns on the object imaged by the machine vision system.

34. The method of claim 26, wherein the boundary location is determined with a resolution of better than 5 microns on the object imaged by the machine vision system.

35. The method of claim 26, wherein the boundary location is determined with a sub-pixel resolution relative to the image of the object imaged by the machine vision.

36. A method for operating a machine vision system, the machine vision system comprising:

a set of image texture filtering elements;

a first mode of edge detection that determines a location of an edge using characteristics other than texture around the edge on an image of an object imaged by the machine vision system;

a second mode of edge detection that determines a location of an edge using the texture around the edge on an image of the object imaged by the machine vision system by using the set of image texture filtering elements;

an image display;

a user input device;

a graphical user interface; and

a set of at least one edge tool;

the method comprising:

acquiring the image of the object including an edge whose location is to be determined;

displaying the acquired image of the object on the image display;

selecting the at least one edge tool;

identifying an area of interest in the displayed image by positioning the at least one edge tool relative to the edge whose location is to be determined;

selecting at least one of the first and second modes of edge detection; and

determining a case-specific edge locating routine based on the selected at least one of the first and second modes of edge detection, the case-specific edge locating routine used to determine a boundary location useable as a dimensional inspection measurement for the object that is imaged by the machine vision system.

37. The method of claim 34, wherein the at least one edge tool is selectable by a user of the of the machine vision system and is usable with the selected at least one of the first and second modes of edge detection without consideration of the selected at least one of the edge detection modes by the user.

38. The method of claim 35, wherein the selecting the at least one of the first and second modes of edge detection comprises:

automatically determining at least one texture characteristic in regions on both sides of an edge in the area of interest; and

automatically selecting the at least one of the first and second modes of edge detection based on the determined at least one texture characteristic.

39. The method of claim 34, wherein when the second mode of edge detection is selected, the case-specific boundary locating routine comprises:

generating a pseudo-image that includes the boundary location, the pseudo image based on the image texture filtering elements selected according to the second mode of edge detection; and

performing an edge detection operation on the pseudo-image of the boundary location to determine a boundary location that is useable as a dimensional inspection measurement for the object imaged by the machine vision system.

40. A case-specific boundary locating system for determining a boundary location on an image of an object that is imaged by a machine vision system having at least two image filtering elements, the system comprising:

a filtered image analyzing section that applies the at least two filtering elements to a textured input image in an area of interest to determine modified data, and that determines filtered image results based on the modified data;

a case-specific filter selection section that selects at least one of the at least two filtering elements that best emphasize the boundary location in the area of interest based on the filtered image results;

a pseudo-image generating section that generates a pseudo-image in the area of interest based on the selected at least one of the at least two filtering elements;

an edge point analyzing section that is applied to the pseudo-image in the area of interest to estimate one or more edge points in the pseudo-image; and

a boundary locating and refining section that analyzes the one or more estimated edge points to determine if they correspond to criteria for a reliable edge.

41. A case-specific edge locating system having a case-specific edge locating routine for determining a location of an edge on an image of an object that is imaged by a machine vision system, the system comprising:

a set of image texture filtering elements;

a first mode of edge detection that determines the location of the edge using characteristics other than texture around the edge on the image of the object imaged by the machine vision system;

a second mode of edge detection that determines the location of the edge using the texture around the edge on the image of the object imaged by the machine vision system by using the set of image texture filtering elements;

a graphical user interface;

an image display that displays an acquired image of the object on the image display; and

a user input device that selects at least one edge tool;

wherein:

an area of interest is identified in the displayed acquired image by positioning the at least one edge tool relative to the edge whose location is to be determined, at least one of the first and second modes of edge detection is selected, and the case-specific edge locating routine is determined based on the selected at least one of the first and second modes of edge detection and is used to determine the location of the edge that is useable as a dimensional inspection measurement for the object.